

CLAIMS

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1. A device for sealing a hole in a blood vessel, comprising:
a ring;
a plurality of spikes extending from said ring, towards a center of said ring and to first
direction along an axis of said ring, said spikes being adapted for engaging a blood vessel;
a plurality of tabs extending substantially radially from said ring,
wherein rotating said tabs around said ring distorts said ring such that said spikes are
10 rotated in a same direction as said tabs.
2. A device according to claim 1, wherein said device is comprised of a super-elastic
material.
- 15 3. A device according to claim 1, wherein said spikes are curved.
4. A device according to claim 1, wherein said tabs and said spikes are attached in pairs
of one spike and one tab at a plurality of locations along the circumference of said ring.
- 20 5. A device according to claim 1, wherein said tabs and said spikes are not attached at
same locations along the circumference of said ring.
6. A device according to claim 1, wherein said spikes are evenly arranged around the
circumference of said ring.
- 25 7. A device according to claim 1, wherein said ring has a resting state in a shape of a
circle.
8. A device according to claim 1, wherein said ring has a resting state in a shape of an
30 ellipse with a large ratio between the length of its two axes.
9. A device according to claim 8, wherein said spikes are arranged on opposing sides of
said ellipse.

10. A device according to claim 1, wherein said spikes are substantially perpendicular to a plane defined by said ring.

5 11. A device according to claim 1, wherein said spikes are slanted in a same direction relative to a plane defined by said ring.

12. A device according to claim 1, wherein said ring is radially expandable.

10 13. A device according to claim 1, wherein said plurality of spikes comprises two spikes.

14. A device according to claim 1, wherein said plurality of spikes comprises three spikes.

15 15. A device according to claim 1, wherein said plurality of spikes comprises five spikes.

16. A device according to claim 1, wherein said plurality of spikes comprises six spikes.

17. A cannula having mounted thereon a hole closure device according to any of claims 1-16.

20 18. A cannula according to claim 17, wherein said cannula comprises an aortic cannula.

19. A cannula according to claim 17, wherein said cannula comprises a femoral cannula.

25 20. A vascular port having mounted thereon a hole closure device according to any of claims 1-16.

30 21. A vascular access kit comprising:
a sterile container for the kit;
a vascular port; and
a suture-less hole closure device adapted to fit over said port.

22. A kit according to claim 21, wherein said hole closure device is according to any of claims 1-16.

37. A method of implanting a clip from inside a blood vessel, comprising:
providing a clip having at least two spikes inside the blood vessel;
spreading apart the spikes and maintaining them in said spread configuration;
retracting said clip such that said clip engages said blood vessel on either side of a hole
in said vessel; and
releasing said clip.

38. A method according to claim 37, wherein releasing said clip comprises releasing at least one end of a thin cable that holds said clip in a loop of said cable.

39. A method according to claim 37, comprising releasing said spikes from said spread configuration after said retracting.

40. A method of controlling a super-elastic device using a wire, comprising:
engaging said device between a loop in a wire and a holding surface;
applying a force away from said holding surface to distort said device;
deploying said device in a desired location; and
releasing at least one end of said wire thereby freeing said device.

41. A method according to claim 40, comprising ceasing said force, thereby allowing said device to relax.

42. A method according to claim 40, wherein said device comprises a clip.

43. A device for sealing a hole, comprising:
an undulating ring having a plurality of inwards pointing portions and a plurality of
outwards pointing portions; and

a plurality of spikes, wherein said spikes extend towards a center of said ring from portions of said ring intermediate said inwards and said outwards pointing portions.

44. A device according to claim 43, wherein said device is formed of a single piece of sheet metal, without heat treatment after forming.

~~23~~₄₅ a device according to claim 43, wherein said device is super-elastic.

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23. A vascular access kit comprising:

a sterile container for the kit;

a vascular port; and

a suture-less hole closure device adapted to fit through said port.

24. A vascular access kit according to claim 23, comprising a device holder adapted to fit through said port and adapted for holding said device.

25. A kit according to claim 23, wherein said device comprises a clip.

26. A kit according to claim 23, comprising:

an outer element adapted to mount over said port; and

a base for a hole closure device adapted to cooperate with said hole closure device to seal a hole remaining in said vessel when said port is removed.

27. A set of a hole closure device and a delivery system, comprising:

a delivery system comprising:

an inner rod;

at least one peg extending from said rod and axially movable relative to said rod;

a device comprising:

a base;

a curved spike extending from said base in a same general direction,

wherein, said peg is engaged by said device, in a resting configuration, between said base and said curved spikes and wherein said curved spikes are configured such that when said peg is retracted from said base, said peg causes said spikes to rotate, around a line perpendicular to said retraction.

28. A device and system according to claim 27, wherein said system comprises a tube adapted to pass over said inner rod and advance to apply force against said spikes in a direction that causes them to rotate opposite from said peg retraction.

29. A device and system according to claim 27, wherein said device is plastically deformed by said retraction of said peg.

30. A device and system according to claim 29, wherein said spikes are mounted on protrusions from said base.

31. A two part hole closure device for a blood vessel, comprising:

a base part comprising:

a skeleton; and

a plurality of spike receptacles disposed around said skeleton;

a spike part adapted for contact with blood flow comprising:

a plurality of spikes having tips and adapted for fitting in said plurality of receptacles, wherein said spikes are curved such that when said spike part is inserted in said base part, said spike tips are in a plane substantially parallel to said base part.

32. A device for implanting a clip having a base and at least two spikes inside a blood vessel, comprising:

an elongate rod adapted to engage said base of said clip at its end;

a tube fitted over said rod and slideable with respect to said rod,

wherein said rod and said tube are designed to cooperate with a particular clip, such that when said clip is engaged by said rod and said tube is advanced towards said clip, said spikes of said clip are spread apart.

33. A device according to claim 32, wherein said rod includes at least one cable guide and wherein a cable is provided through said cable guide to maintain said clip in place.

34. A device according to claim 33, wherein said cable guide comprises a lumen in said rod.

35. A device according to claim 33, wherein said cable guide comprises a groove along said rod.

36. A device according to claim 32, wherein said tube comprises at least one notch for engaging said clip.